



January 12, 1995

Integrated Support Environment (ISE) System Architecture Review

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January 12, 1995

System Architecture Review Agenda

Agenda Item

Time

Introduction

2:30 - 2:35

Design Approach and Tradeoffs

2:35 - 2:40

External Interfaces

2:40 - 2:45

Functional Architecture

2:45 - 3:10

Network/Computational Infrastructure

3:10 - 3:20

BREAK

3:20 - 3:30

ISE Toolbox

3:30 - 4:00

Integrated Information Repository

4:00 - 4:05

Test Buddy

4:05 - 4:10

Open Discussion

4:10 - 4:30



EOSDIS IV & V Infrastructure and Tool Development (Task 4)

- **Milestone 1 (M1)**
 - Identify near term IV&V task needs
 - Evaluate candidate products
 - Establish hardware/network infrastructure
 - Incorporate COTS and GOTS
 - Minimize development and customization
- **Integrated Support Environment (ISE)**
 - Identify long term IV&V task needs
 - Evaluate candidate products
 - Acquire needed development tools and training
 - Populate ISE Toolbox (extend M1 toolset)
 - Focus on tool and data integration



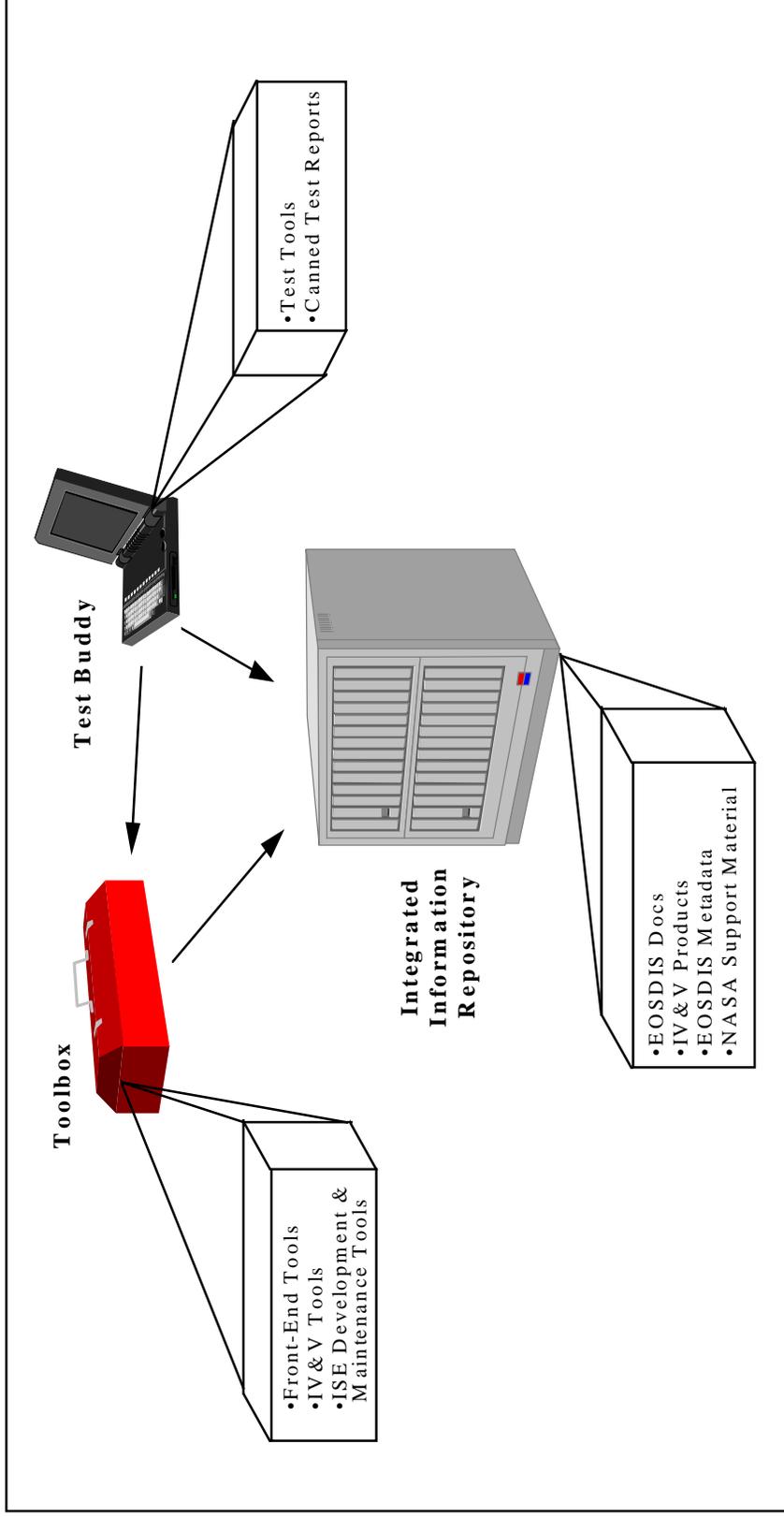
Significant Milestones/Deliverables

- **M1 Demonstration of 18 and 19 October 1994**
- **ISE System Requirements Document dated 28 October 1994**
- **ISE System Architecture Document dated 15 December 1994 (DRAFT)**
- **ISE System Architecture Document initial release due 31 January 1995**
- **ISE Software Development Plan due 28 February 1995 (DRAFT - 31 January 1995)**



Introduction

Major ISE Components





Architectural Views

- **Functional Architecture**
- **Physical Architecture**
 - **Network/Computational Infrastructure**
 - **ISE Toolbox**
 - **Integrated Information Repository (IIR)**
 - **Test Buddy**



Presentation Objectives

- **Communicate abstract of ISE System Architecture Document (DRAFT)**
- **Detail progress against the establishment of the ISE**
- **Solicit feedback regarding ISE System Architecture for incorporation into document**
- **Respond to audience questions**



Design Approach and Tradeoffs

Architecture Concept

- **put cut and paste picture here**





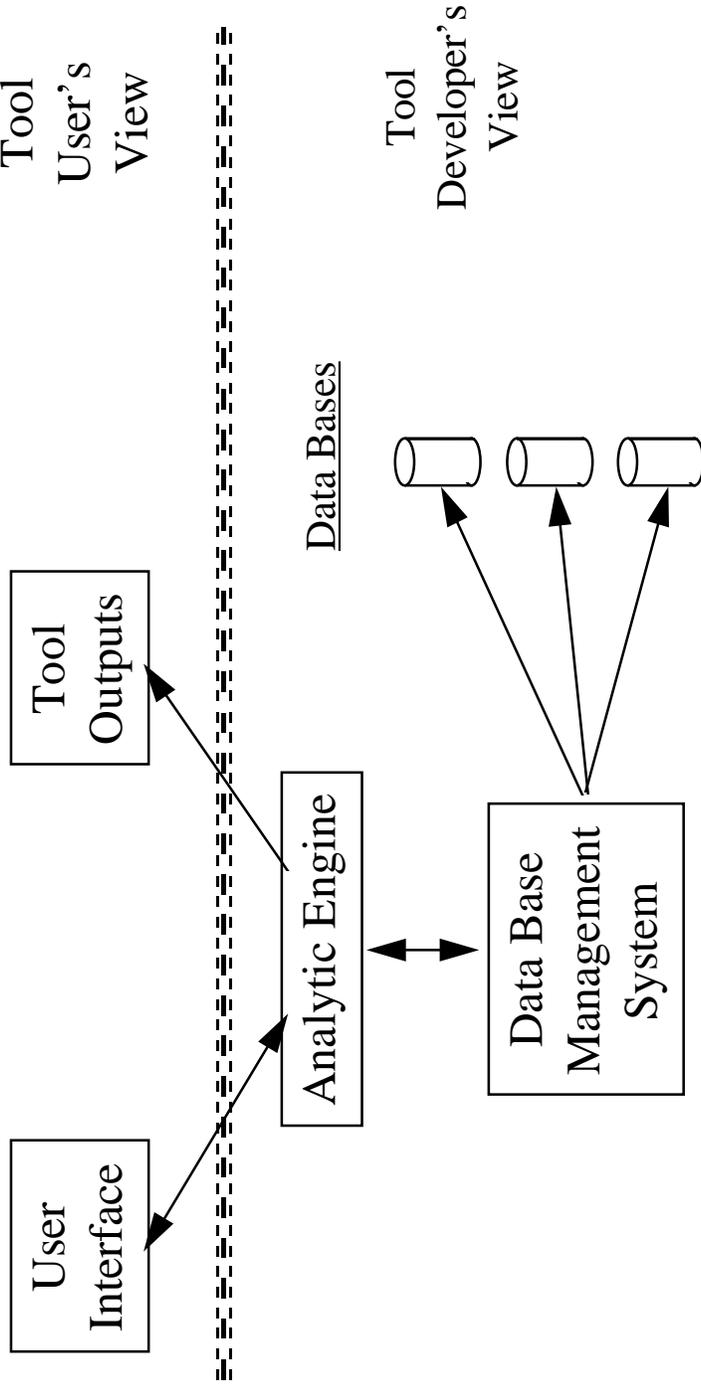
ISE Development Approach

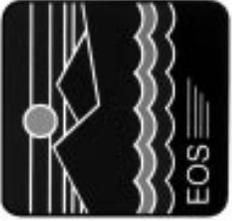
- **Maximize tool/data integration**
- **Configuration/Integration versus Development**
- **Spiral Model Selection**





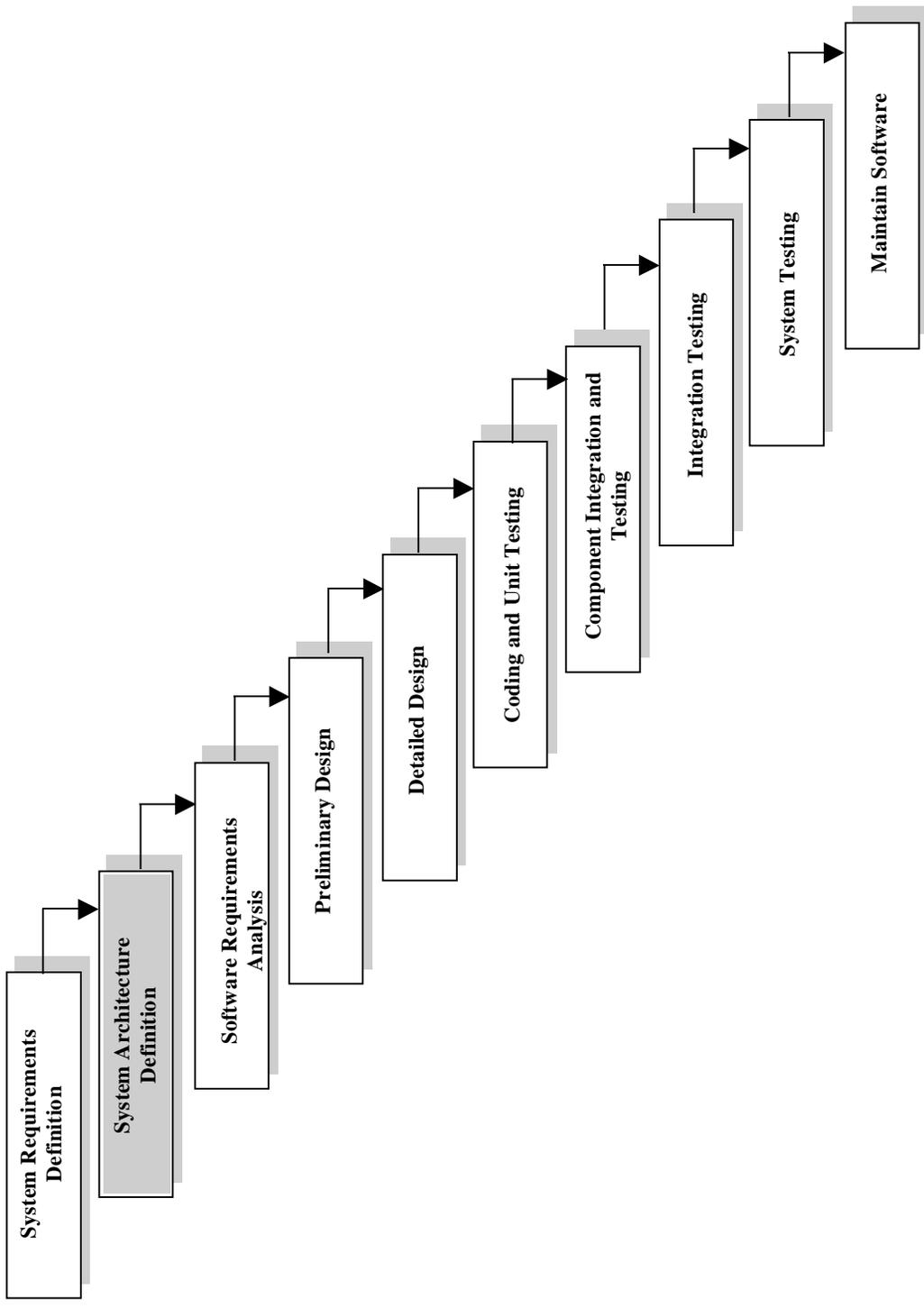
Tool Development Paradigm





Design Approach and Tradeoffs

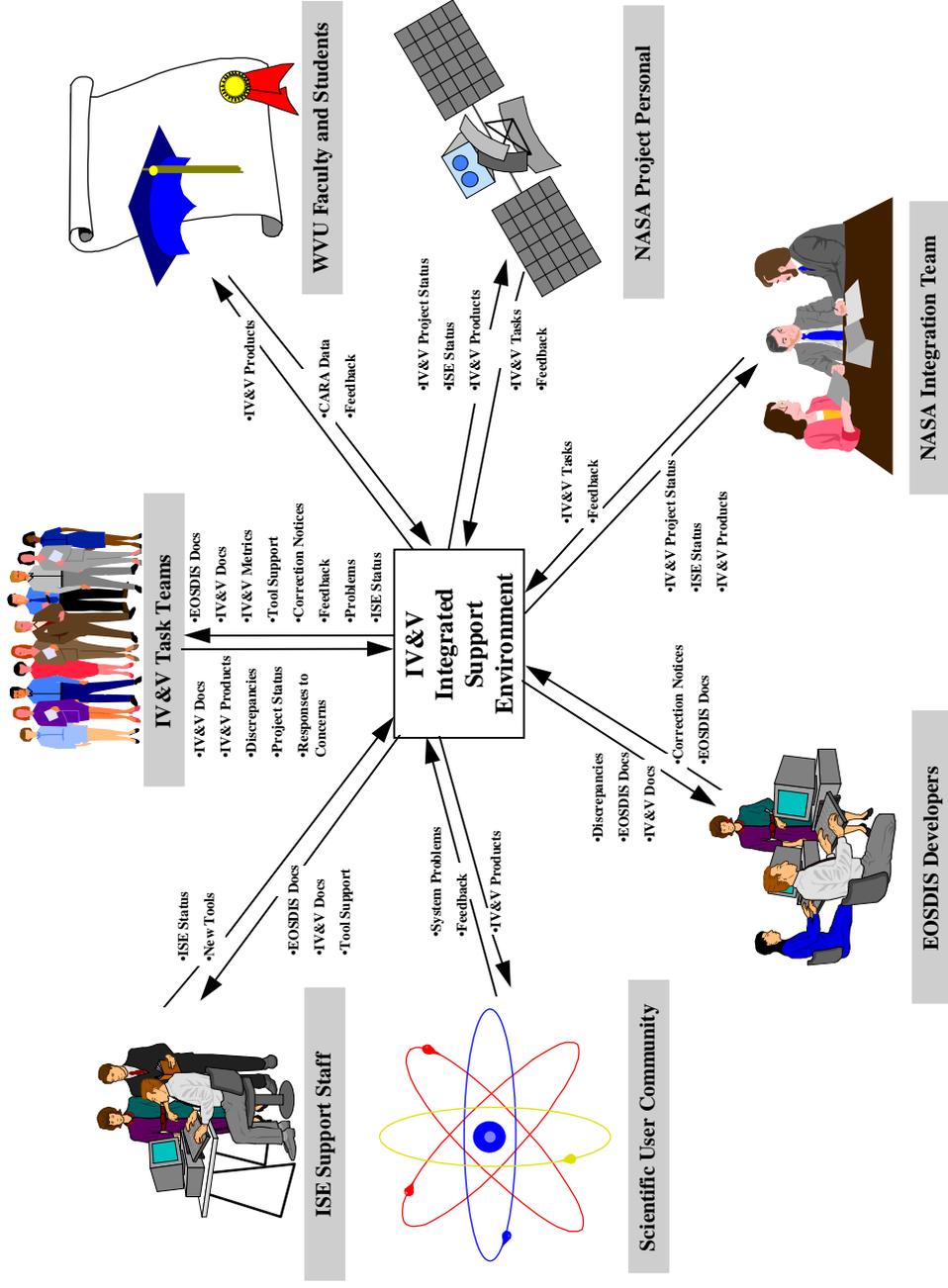
Software Development Process





External Interfaces

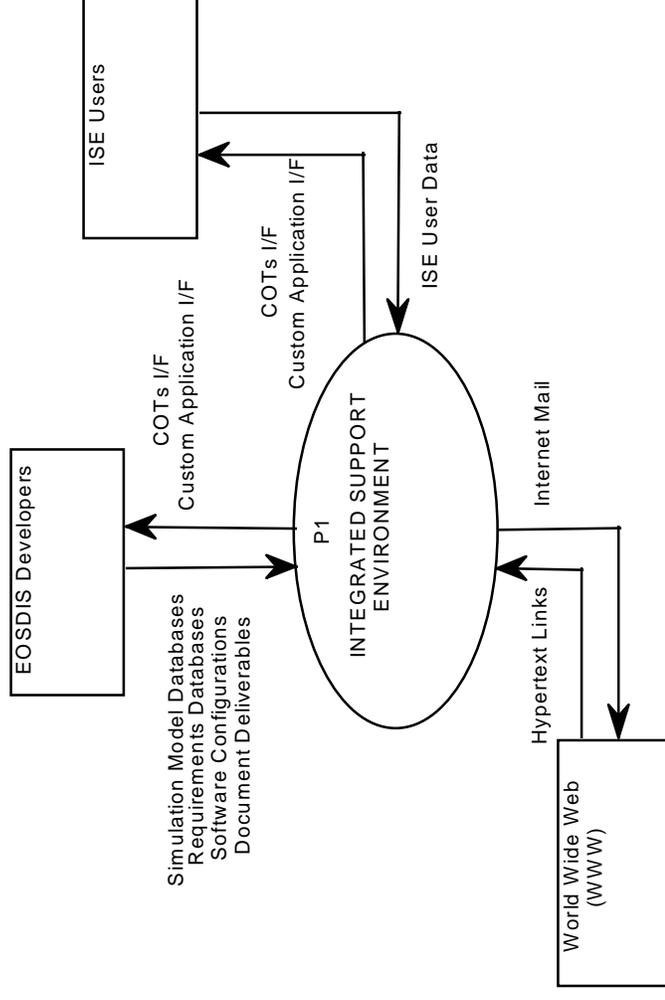
ISE User Community





External Interfaces

ISE Context Diagram





Functions/Capabilities Supported

- **Executive Interface**
- **Document Navigation and Browsing**
- **Traceability Analysis**
- **Requirements Evaluation**
- **Interface Analysis**
- **Test Planning**
- **Test Execution, Analysis and Mgmt.**
- **Discrepancy Tracking and Reporting**
- **System Modeling and Simulation**
- **Design Analysis**
- **Code Analysis**
- **Criticality Analysis and Risk Assessment (CARA)**
- **Activity Scheduling**
- **ISE Development and Administration**
- **Equipment Management**
- **Analyst's Notebook**
- **Configuration Management**
- **Document Management**
- **Database Management**
- **File Management**



Functional Architecture

Layered Functional Architecture



User Interface



FUNCTION	-Traceability Analysis (RTM)	-Requirements Evaluation -I/F Analysis (SQL Windows)	-Test Planning -Test Execution -Test Analysis -Test Management	-Discrepancy Tracking & Reporting (DDTs)	-Configuration Management	-System Modeling & Simulation (BONES) -Design Analysis -Code Analysis	-CARA Activity Scheduling	-ISE Development & Admin.	-Data Management Documents Equipment Analyst's Notebook
	Data Storage	Oracle DB	SQL Server DB	ClearCase/PVCS			Lotus Notes DB		
File Management (Sun Solaris, DOS/Windows, Mac OS)									



Function/Capability Overview

- **Executive Interface**
 - Provides user logon and logoff
 - Enables tool initiation and navigation
 - Enforces tool level access control
- **Document Navigation and Browsing**
 - Provides access to items maintained within Data Management Library
- **Traceability Analysis**
 - Provides for upward, downward, and peer-to-peer traceability of lifecycle information



Function/Capability Overview (Cont.)

- **Requirements Evaluation**
 - Provides forum for evaluation in terms of traceability, quality, and testability
 - Provides data capture, browsing, and reporting capabilities
- **Interface Analysis**
 - Provides forum for evaluating interfaces for consistency, completeness, integrity, etc.
 - Provides data capture, browsing, and reporting capabilities



Function/Capability Overview (Cont.)

- **Test Planning**
 - Provides forum for documenting plans, schedules, etc.
 - Enables browsing of information pertinent to testing
- **Test Execution, Analysis, and Management**
 - Provides tools required for test execution, result analysis, and test resource management





Function/Capability Overview (Cont.)

- **Discrepancy Tracking and Reporting**
 - Support required for managing, tracking, and reporting on various categories of problems
- **System Modeling and Simulation**
 - Provides support for model design, input variations, simulation, and result analysis
- **Design Analysis**
 - Support for design analysis corresponds to traceability and design module analysis tools



Function/Capability Overview (Cont.)

- **Code Analysis**
 - Support for code analysis corresponds to traceability and code module static analysis
- **CARA**
 - Provides capabilities for data capture and reporting
- **Activity Scheduling**
 - Provides support for task scheduling including resource allocation, leveling, and task dependencies



Function/Capability Overview (Cont.)

- **ISE Development and Administration**
 - Provides an environment necessary to establish and maintain the ISE
- **Equipment Management**
 - Provides a database capability for maintaining GFE
- **Analyst's Notebook**
 - Provides a database capability for maintaining analysis notes which are not included in other sources



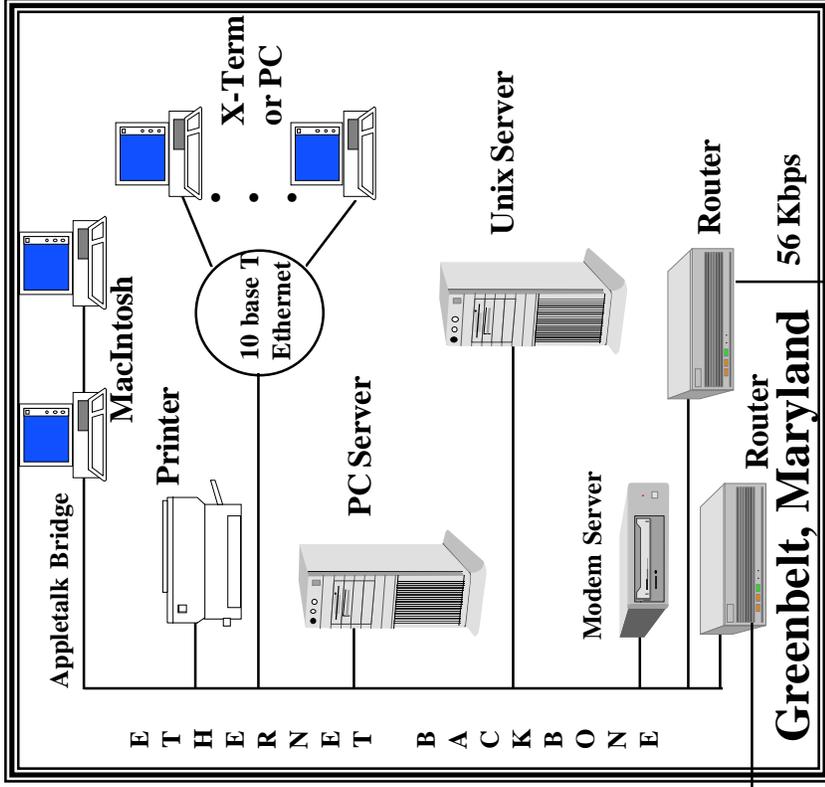
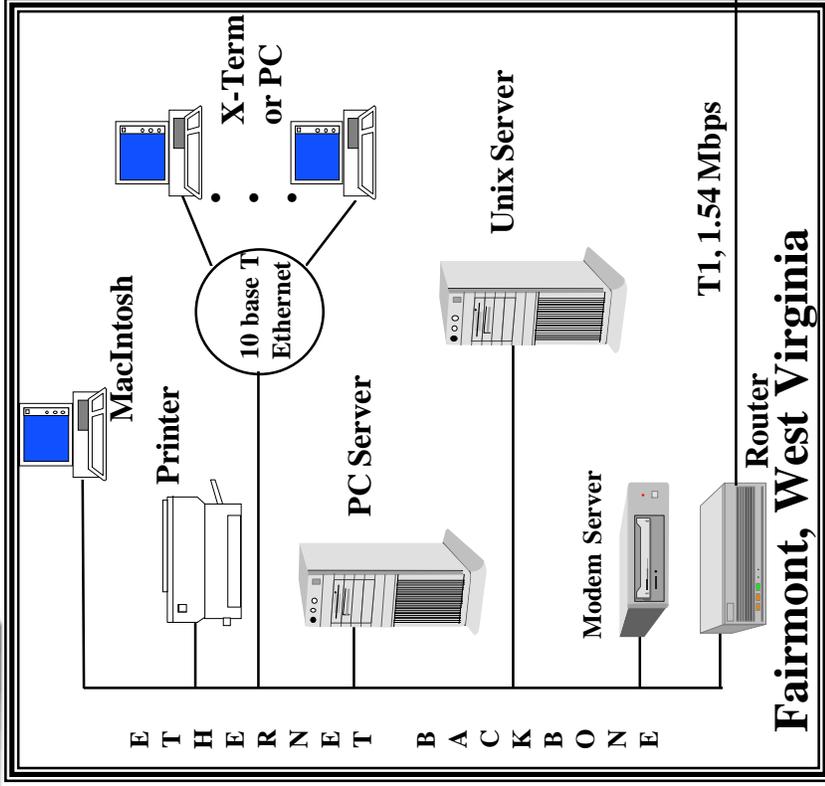
Function/Capability Overview (Cont.)

- **Configuration Management**
 - Provides configuration control capabilities
- **Document Management**
 - Provides support for maintaining deliverables
- **Database Management**
 - Provides RDBMS
- **File Management**
 - Provides network file management capabilities



Network/Computational Infrastructure

Network/Computational Infrastructure



56 Kbps

56 Kbps



Hardware Description

Hardware Element, Location (Quantity)	Description	Function
Unix File Server, Fairmont (1)	SUN Sparc 1000 <ul style="list-style-type: none"> • 1 GB Internal HD • 4.2 GB Hard Drive • 128 MB RAM • 4MB NAVRAM • CD ROM • 4mm tape drive • SCSI buffered ethernet • Solaris C Compiler • Solaris 2.3 OS 	<ul style="list-style-type: none"> • File server for the X window terminals • Support tool development • Processor for Unix based tools and applications • Central Repository for IV&V data, documentation, and information • Access control • Configuration management • Support Unix based communication across WAN
Unix File Server, Greenbelt (1)	SUN Sparc 20 <ul style="list-style-type: none"> • 2.1 GB HD • 64 MB RAM • CD ROM • 4mm tape drive • SCSI buffered ethernet • sol12.x disk 	<ul style="list-style-type: none"> • File server for the X window terminals • Processor for Unix based tools and applications • Local Repository for IV&V data, documentation, and information • Access control • Support Unix based communication across WAN
X-terminals, Greenbelt (8) and Fairmont (3)	HDS View Station <ul style="list-style-type: none"> • 20 inch color monitor • 8 MB RAM • SUN5 Keyboard 	<ul style="list-style-type: none"> • Terminal client for X-Window based applications



Hardware Description

Hardware Element, Location (Quantity)	Description	Function
DOS PC, Greenbelt (29) and Fairmont (10)	Gateway P4D-66 <ul style="list-style-type: none"> • Intel 486DX 66 Mhz processor • 16 MB RAM • 540 MB HD • CD ROM • 17 inch color monitor 	<ul style="list-style-type: none"> • Personal computer for office automation software, desktop publishing, word processing, and electronic mail • May serve as an X-Window client terminal
DOS PC Server, Greenbelt (1) and Fairmont (1)	Gateway P4D-66 <ul style="list-style-type: none"> • Intel 486DX 66 Mhz processor • 40 MB RAM • 1 GB Internal HD • CD ROM • SCSI Controller • 15 inch monitor 	<ul style="list-style-type: none"> • File server for DOS PCs • Processor for DOS based tools and applications • PC Access control • Support NOVELL based communication across WAN
Modem Server, Greenbelt (1) and Fairmont (1)	Netblazer	<ul style="list-style-type: none"> • Provide remote dial-in capability access to Unix Server and PC Server



Hardware Description

Hardware Element, Location (Quantity)	Description	Function
Macintosh Computer, Greenbelt (4) and Fairmont (1)	Power Macintosh 6100/60 AV <ul style="list-style-type: none">• 16 MB RAM• 250 MB Internal HD• CD ROM• 3.5 inch floppy drive Duodock	<ul style="list-style-type: none">• Personal computer for office automation software, desktop publishing, word processing, and electronic mail
Macintosh Computer, Greenbelt(1)		<ul style="list-style-type: none">• Personal computer with removable laptop for office automation software, desktop publishing, word processing, and electronic mail
Macintosh Computer, Greenbelt(1)	Macintosh LCIII	<ul style="list-style-type: none">• Personal computer for office automation software, desktop publishing, word processing, and electronic mail
Macintosh Laptop Computer, Greenbelt(1)	Macintosh Powerbook 170	<ul style="list-style-type: none">• Personal computer for office automation software, desktop publishing, word processing, and electronic mail



Hardware Description

Hardware Element, Location (Quantity)	Description	Function
Appletalk Bridge, Greenbelt (1) and Fairmont (0)	Telephone wire	<ul style="list-style-type: none">• Provide network communication from thinnet backbone to Appletalk network
Appletalk Network, Greenbelt (1) and Fairmont (0)	Telephone wire	<ul style="list-style-type: none">• Provide Network communication between Macintosh computers
10baseT ethernet LAN, Greenbelt (1) and Fairmont (1)	Twisted pair ethernet	<ul style="list-style-type: none">• Provide network communication for PC and X-terminal clients to Servers through the thinnet backbone
thinnet backbone, Greenbelt(1) and Fairmont (1)	Thin Coaxial Cable	<ul style="list-style-type: none">• Provide network communication between routers, servers, 10baseT ethernet LAN, and Macintosh network





Hardware Description

Hardware Element, Location (Quantity)	Description	Function
thinnet backbone, Greenbelt(1) and Fairmont (1)	Thin Coaxial Cable	<ul style="list-style-type: none">• Provide network communication between routers, servers, 10baseT ethernet LAN, and Macintosh network
PSCNI Router, Greenbelt (1)	To be supplied by NASA	<ul style="list-style-type: none">• Provide connectivity for Greenbelt thinnet backbone to NASA PSCNI 56 Kbps line to GSFC
INTERMETRICS Corporate Network Router, Greenbelt (1)	Proteon P 4200	<ul style="list-style-type: none">• Provide connectivity for Greenbelt thinnet backbone to INTERMETRICS Corporate Network
PSCNI Router, Fairmont (1)	To be supplied by NASA	<ul style="list-style-type: none">• Provide connectivity for Fairmont thinnet backbone to NASA PSCNI T1 line to GSFC





Infrastructure Status

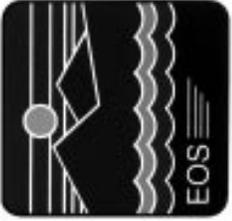
- Sun SPARC file servers operational
- X-Terminals operational
- T1 (1.554 Mbps) line between GSFC and Fairmont
- 56 Kbps line between GSFC and Greenbelt office installed
- Fairmont Mail Server on order
- System Administration Training Approved (Solaris 2.3 and Novell)



ISE Toolbox

Analysis/Tracking Tools

Tool Info	Brief Description	Purpose of Tool
Tools Analysis/Tracking Tools RTM/Oracle	The Requirements Traceability Management (RTM) tool is an information management tool which allows for the definition of object classes and their interrelationships. Traceability of requirements throughout the software lifecycle is the target market.	RTM directly supports the Requirements Analysis IV&V activity. Due to the traceability information maintained, it is also supports interface, design, code, and test analysis activities.
BONEs	The Block Oriented Network Simulator (BONEs) provides for model design, model simulation, and simulation analysis.	BONEs supports the interface and design analysis activities. It provides a mechanism to verify various performance related parameters.
DDTs	The Distributed Defect Tracking System (DDTs) is a configurable defect tracking system which is integrated with various configuration management (CM) products. Out of the box, a predefined set of problem states is utilized but may be reconfigured to fit project needs.	DDTs is a candidate product for managing and tracking various levels of problems for the EOSDIS IV&V project. A definite need which justifies its cost has yet to be defined. The DDTs/ClearCase integration is utilized by HAIS to manage/track defects against the ECS software.



ISE Toolbox

Testing Tools

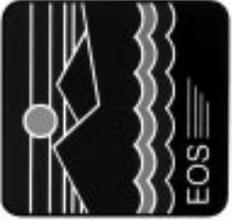
Tool Info	Brief Description	Purpose of Tool
Tools Testing Tools ClearCase	ClearCase is a leading Software Configuration Management (SCM) product which provides a Motif Graphical User Interface (GUI).	The ClearCase product will directly support certification testing activities by providing mechanisms for controlling test related files (e.g. scripts).
XRunner	XRunner automates user operations associated with GUI testing. It falls under the "capture/playback" tool classification based upon its ability to record GUI objects, mouse tracks, keystrokes, etc.	XRunner will directly support interface testing and certification testing activities by allowing for fully programmable test scripting. HAIS is also utilizing XRunner for internal testing activities.
LoadRunner	LoadRunner is an automated testing system for multi-user Unix X applications. LoadRunner allows for emulation of multiple users running in parallel on a single machine or spread across multiple machines.	LoadRunner is a leading candidate for supporting certification testing activities where emulation capabilities are needed. Analysis is still being performed to determine specific needs and to determine if a more cost effective solution exists. HAIS is utilizing LoadRunner during testing activities to emulate various components of EOSDIS.



ISE Toolbox

ISE Development Tools

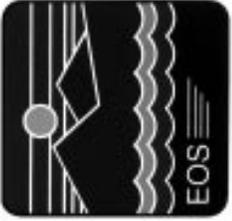
Tools	Tool Info	Brief Description	Purpose of Tool
ISE Development Tools Lotus Notes		Lotus Notes is a groupware tool providing information management capabilities for workgroups. Precanned database applications come with the product. The precanned applications may be tailored or new applications may be developed.	Lotus Notes provides a mechanism for managing and sharing non-relational information across a LAN or WAN. It is used to support the information management needs for multiple IV&V tasks.
Adobe Acrobat		Adobe Acrobat is a tool for managing the translation of documents into a form which is accessible independent of the platform. Document conversion to PDF format allows for documents to be read using the Acrobat Reader which is a freeware product.	Adobe Acrobat allows for the EOSDIS IV&V deliverables to be converted to PDF form so that they may be read using the Acrobat Reader. Note that PDF format is one that is available for viewing through Mosaic applications.
PVCS		PVCS is one of the most widely used and relatively low cost SCM tools on the market. The version of PVCS requested allows for multi-mode CM under both the PC/Windows and Sun/Solaris environments.	PVCS will provide CM capabilities for ISE development activities undertaken in either Visual C++ or SQLWindows.
SQLWindows		SQLWindows is a client/server development system which incorporates GUI building capabilities with database access. This tool provides for efficient development of PC/Windows client/server applications	SQLWindows will be used to develop the identified ISE client/server applications which support IV&V activities.



ISE Toolbox

ISE Development Tools

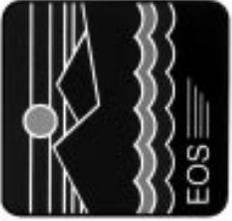
Tool Info	Brief Description	Purpose of Tool
Tools ISE Development Tools Sybase SQL Server	Sybase SQL Server is a widely used Relational Database Management System (RDBMS).	Sybase SQL Server will provide for storage of relational information entered via the developed client/server applications.
Open Client	Open Client is a network connectivity product offered from Sybase. It provides the software necessary to execute on the PC client nodes so that data/requests may be routed to the Sybase database on the Sun server.	Open Client is required for client/server development to bridge the connectivity gap between the SQLWindows product and the Sybase database.
SQLNet	SQLNet is a network connectivity product offered from Oracle. It provides the software necessary to execute on the PC client nodes so that data/requests may be routed to an Oracle database on the Sun server.	SQLNet is required for client/server development to bridge the connectivity gap between the SQLWindows product and the RTM/Oracle database.
System Architect	System Architect is a Computer Aided Software Engineering (CASE) tool which supports software analysis and design activities. It allows for definition of analysis and design models using a GUI for numerous analysis and design methods.	System Architect is used during analysis and design activities undertaken during the development of ISE tools.



ISE Toolbox

ISE Development Tools

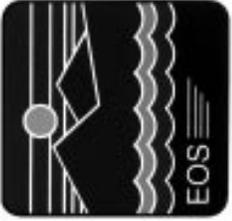
Tool Info	Brief Description	Purpose of Tool
ISE Development Tools Visual C++	Visual C++ provides a full-range of development capabilities associated with developing PC/Windows applications.	Visual C++ is used in ISE development to develop interfaces between ISE tools and to perform algorithmic logic which is not easily coded within SQLWindows.
Mosaic	Mosaic is a browsing interface to information found on the Internet. It allows for configuration of a "Home Page" through the use of an HTTP server.	Mosaic provides an effective forum for making IV&V products available to external users of the ISE.
Acrobat Reader	Acrobat Reader is a freeware product which allows for viewing of documents in PDF format.	Acrobat Reader is used to make IV&V documents accessible to external users via the EOSDIS IV&V Home Page.
Web Genera	Web Genera is a freeware product which provides a front-end interface between a Mosaic browser and Sybase databases.	The functionality provided by Web Genera allows for the ISE development staff to export views of the data maintained in Sybase to the Mosaic end user.



ISE Toolbox

Office Automation Tools

Tool Info	Brief Description	Purpose of Tool
Tools Office Automation Tools		
MS Office Pro	Microsoft Office Pro is a suite of Microsoft products including PowerPoint, Excel, Word, and Access.	The Microsoft Office products are used for document and presentation preparation as well as for spreadsheet and LAN database applications.
MS Project	Microsoft Project is a project management and scheduling product.	Microsoft Project is used by IV&V management and task leaders to schedule program and task activities.
cc:Mail	cc:Mail is an electronic mail tool.	cc:Mail is used as another forum for communication between IV&V personnel. It is also used to provide Internet mail capabilities.
Xsoftware	Xsoftware is a PC X server product which provides the capability to interface with X applications in a PC/Windows environment.	Xsoftware provides IV&V analysts and the ISE development staff with the capability to execute tools such as RTM from their PC as opposed to having to locate an available X-Terminal.



ISE Toolbox

Lotus Notes Applications

Tool Info	Brief Description	Purpose of Tool
Tools Lotus Notes Applications		
Doc Production Tool	The Lotus Notes Document Production tool provides a forum for a team of individuals to work on a document. It also provides a central point of control and is easily accessible.	The ISE development staff is using this tool to coordinate the production of Task 4 deliverables.
Data Management Tool	The Lotus Notes Data Management Tool provides a database for maintaining Government Furnished Equipment (GFE) and IV&V deliverables.	The Data Management Tool is used by Task 2. Task 2 is the Facilities, Operations, and Program Reporting task.
Tech Talk Tool	The Tech Talk Tool provides a forum for communicating technical findings regarding tools, tool bugs, etc. This is appropriate for items which are not documented or stored in any other database.	This database is used by ISE tool users to report and record noteworthy tool findings.
Analysts Notebook Tool	The Analyst Notebook Tool provides a database for maintaining noteworthy items associated with IV&V analysis. Using this database will limit information loss due to personnel changes.	This database will be available for use by all IV&V analysts.
Issue/Discrepancy Handling System (IDHS)	The Lotus Notes IDHS prototype provides an interim solution to tracking submitted issues and Review Item Discrepancies (RIDs) to closure.	The IDHS tool is used to track issues and RIDs submitted by the Intermetrics EOSDIS IV&V team to closure.



ISE Toolbox

Client/Server Applications

Tool Info	Brief Description	Purpose of Tool
Tools Client/Server Applications Automated Requirements Data Base (ARDB)	The ARDB provides a tool for capturing analysis data, accumulating analysis results, and producing summary reports.	The Excel/Word prototype was developed for the Requirements Analysis task.
Interface Analysis Data Base (IADB)	The IADB provides a tool for capturing interface specifications, performing interface consistency checks, and producing summary reports.	The Access prototype is being developed for the Interface Analysis task.
Test Management Data Base (TMDB)	The TMDB enables testers to define or reference test cases, detail required testing resources, and configuration parameters. It also allows for recording test results so that summary reports may be generated.	The TMDB is to provide a database supporting interface and certification testing activities.
CARA Data Capture	The CARA Data Capture tool provides a forum for capturing CARA data so that reports and metrics can be obtained.	The CARA Data Capture tool would provide an automated mechanism for capturing CARA data. It could be used for each CARA performed under the EOSSIS IV&V effort.



ISE Toolbox

ISE User Interface Applications

Tool Info	Brief Description	Purpose of Tool
Tools ISE User I/F Applications Executive Interface	An executive interface to ISE tools hosted on the PC and Sun would be developed for each platform. User logon information would be utilized to configure the interface for each type of user.	An executive interface provides a standardized means of accessing various tools and data for all IV&V activities.
Browsers	An ISE browser interface is to provide ISE users access to EOSSDIS IV&V deliverables.	The browser interface is to be developed to support the diverse ISE user community.



COTS Software

ISE Toolbox

ISE Tool Status

Tools	Status	Freeware/ Shareware	COTS Procured	COTS Under Procurement	COTS Leading Candidate	To Be Developed	To Be Determine
COTS Software							
RTM/Oracle			X				
SQLNet				PLX			
BONeS			X				
DDTs					X		
ClearCase					X		
XRunner					X		
LoadRunner					X		
Xoftware					P		
MS Office			PLM				
MS Project			PM				
cc:Mail			PL				
Lotus Notes			PL				
Adobe Acrobat			PL				
PVCS				P			
SQLWindows				P			
Sybase SQL Server				X			
Open Client				PL			
System Architect				P			
Visual C++			P				

Legend:

- X** - Sun Solaris Platform , **P** - PC MS Windows Desktop, **L** - PC MS Windows Notebook
- M** - Macintosh



Additional COTS Candidates

- **Testing Tools**
 - **Network Analyzers**
 - **Performance/Timing Analyzers**
 - **Data Reducers and Analyzers**
- **Design/Code Analysis**
 - **Complexity Measurement**
 - **Structure Checkers**
 - **Syntax/Semantics Analyzers**
 - **Reverse Engineering/CASE**



Public Domain Software

ISE Tool Status

Tools	Status	Freeware/ Shareware	COTS Procured	COTS Under Procurement	COTS Leading Candidate	To Be Developed	To Be Determined
Public Domain Software							
Mosaic		PLX					
Web Genera		X					
Acrobat Reader		PL					

Legend:

X - Sun Solaris Platform , **P** - PC MS Windows Desktop, **L** - PC MS Windows Notebook

M - Macintosh



ISE Toolbox

Developed Applications

ISE Tool Status

Tools	Status	Freeware/ Shareware	COTS Procured	COTS Under Procurement	COTS Leading Candidate	To Be Developed	To Be Determine
Lotus Notes Applications							
Doc Production Tool						P	
Data Management Tool						P	
Tech Talk Tool						P	
Analysts Notebook Tool						PL	
Issue/Discrepancy Handling System (IDHS)						PL	
Client/Server Applications							
Automated Requirements Data Base (ARDB)						P	
Interface Analysis Data Base (IADB)						P	
Test Management Data Base (TMDB)						PL	
CARA Data Capture							P
ISE User I/F Applications							
Executive Interface						PLX	
Browsers						PLX	

Legend:

X - Sun Solaris Platform , **P** - PC MS Windows Desktop, **L** - PC MS Windows Notebook

M - Macintosh



Application Development Status

- Lotus Notes Applications
 - Document Production (completed)
 - Data Management (completed)
 - Tech Talk (completed)
 - Issue/Discrepancy Handling System (prototyped)
 - Analyst Notebook (not started)



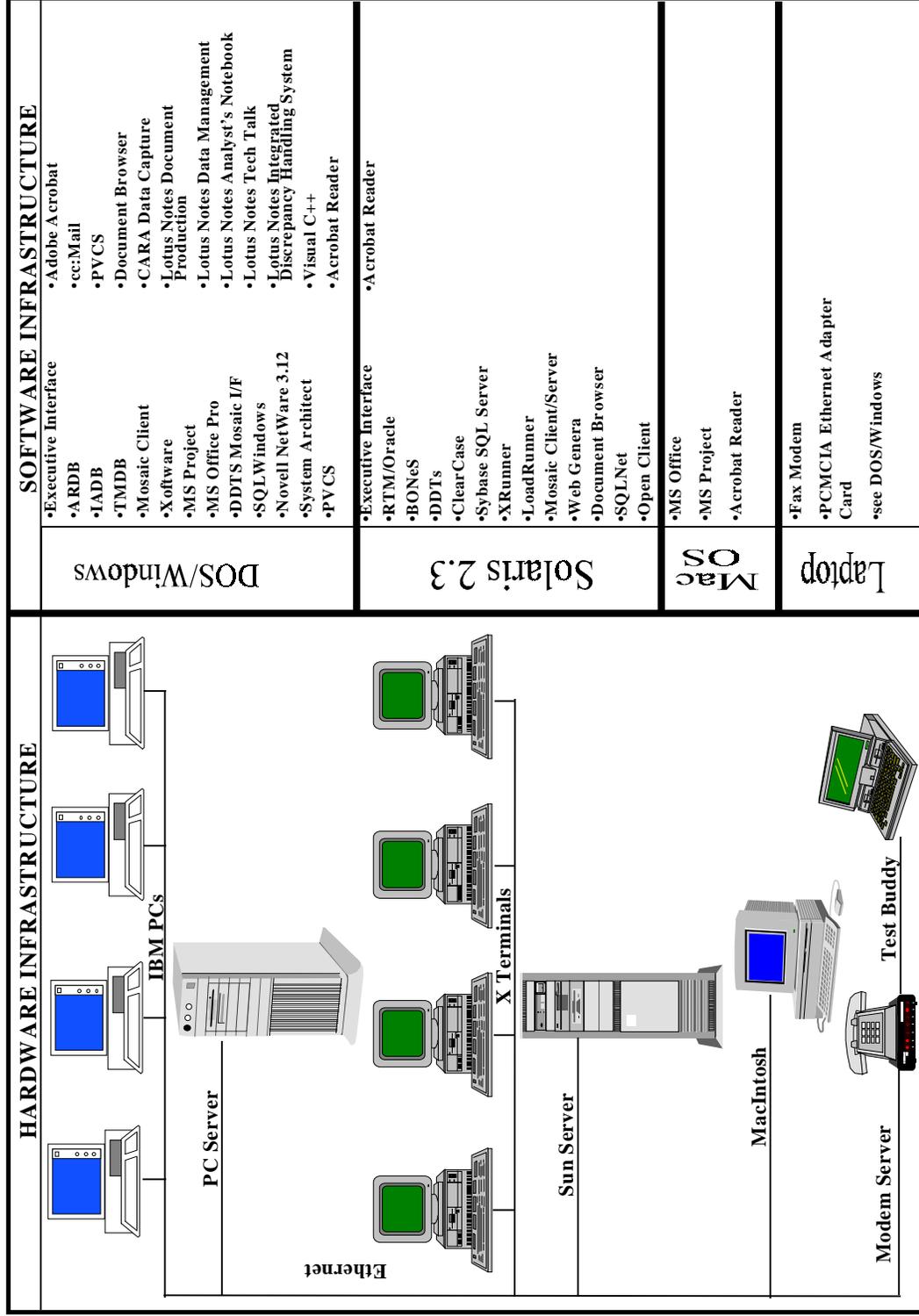
Application Development Status (cont.)

- **Client/Server Applications**
 - **ARDB (prototyped - Excel/Word)**
 - **IADB (prototyped - Access)**
 - **TMDB (analysis initiated)**
- **ISE User Interface Applications**
 - **Executive Interfaces (analysis initiated)**
 - **Browser (prototyped - Mosaic Home Page)**



ISE Toolbox

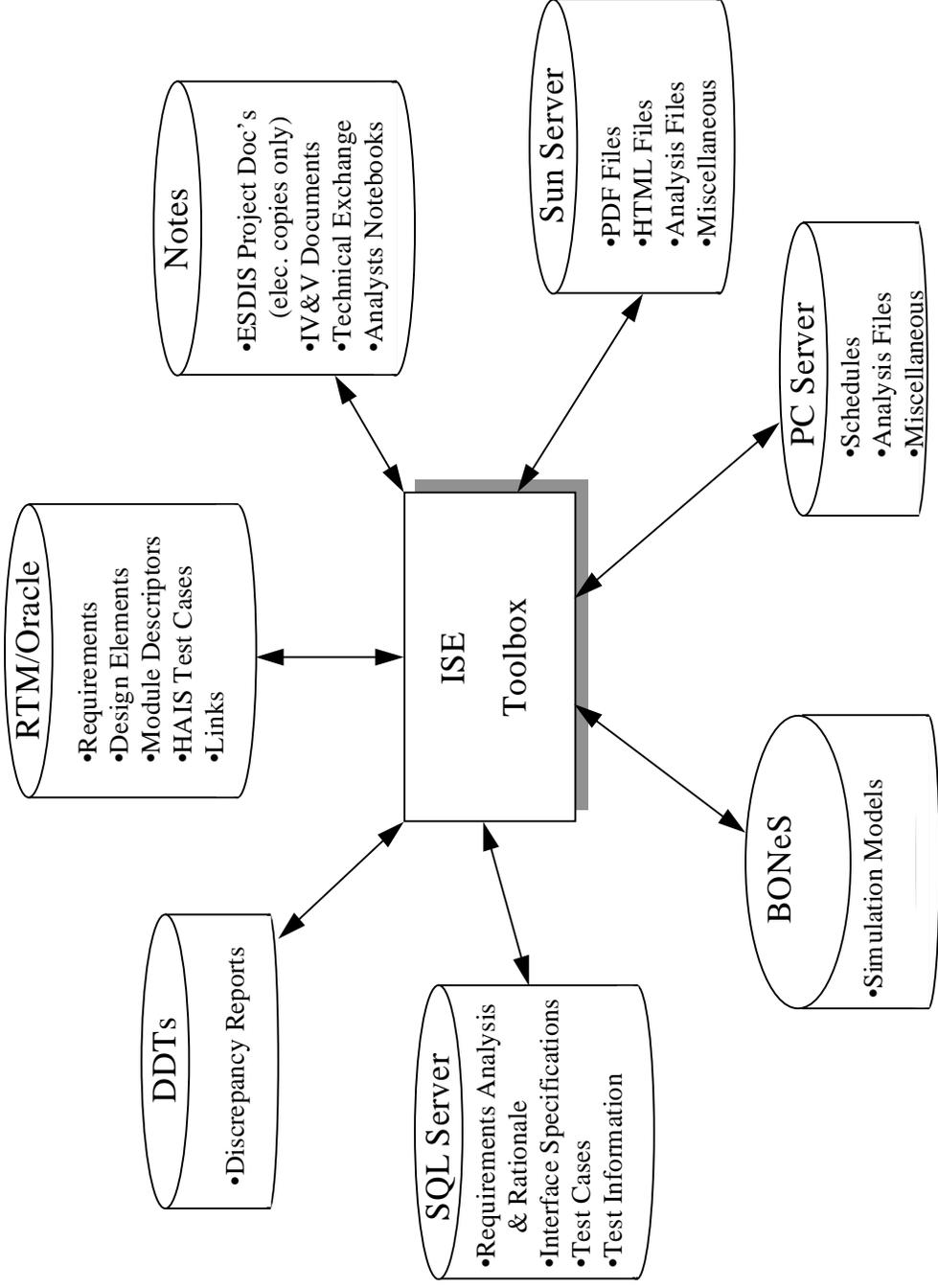
ISE Hardware/Software Infrastructure





Integrated Information Repository

IIR Data Storage

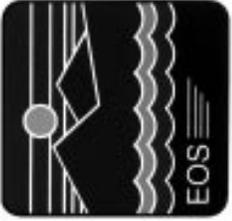




Data Integration Approach

- **Develop Client/Server Applications**
- **Utilize SQL Windows from Gupta Corp.**
 - Provides Lotus Notes interface
 - Provides cc:Mail interface
 - Provides RDBMS routers for Oracle, Sybase, etc.



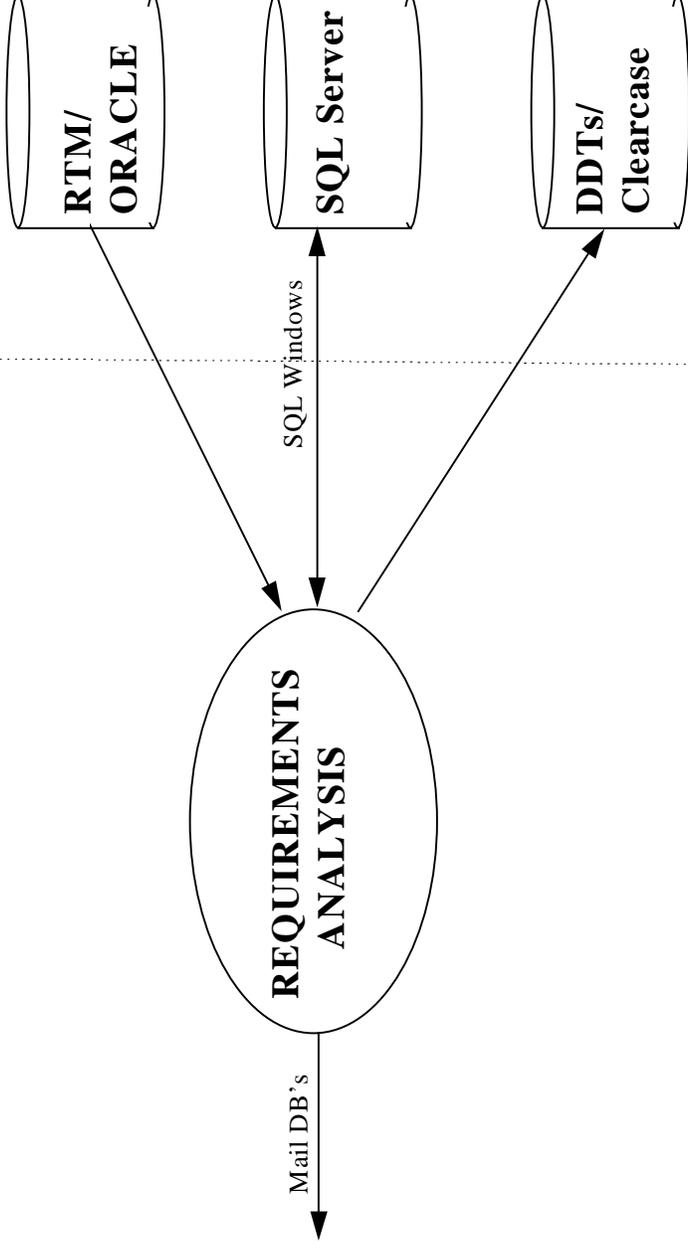


Requirements Analysis Database Interaction

Platform:

PC/TEST BUDDY

SUN



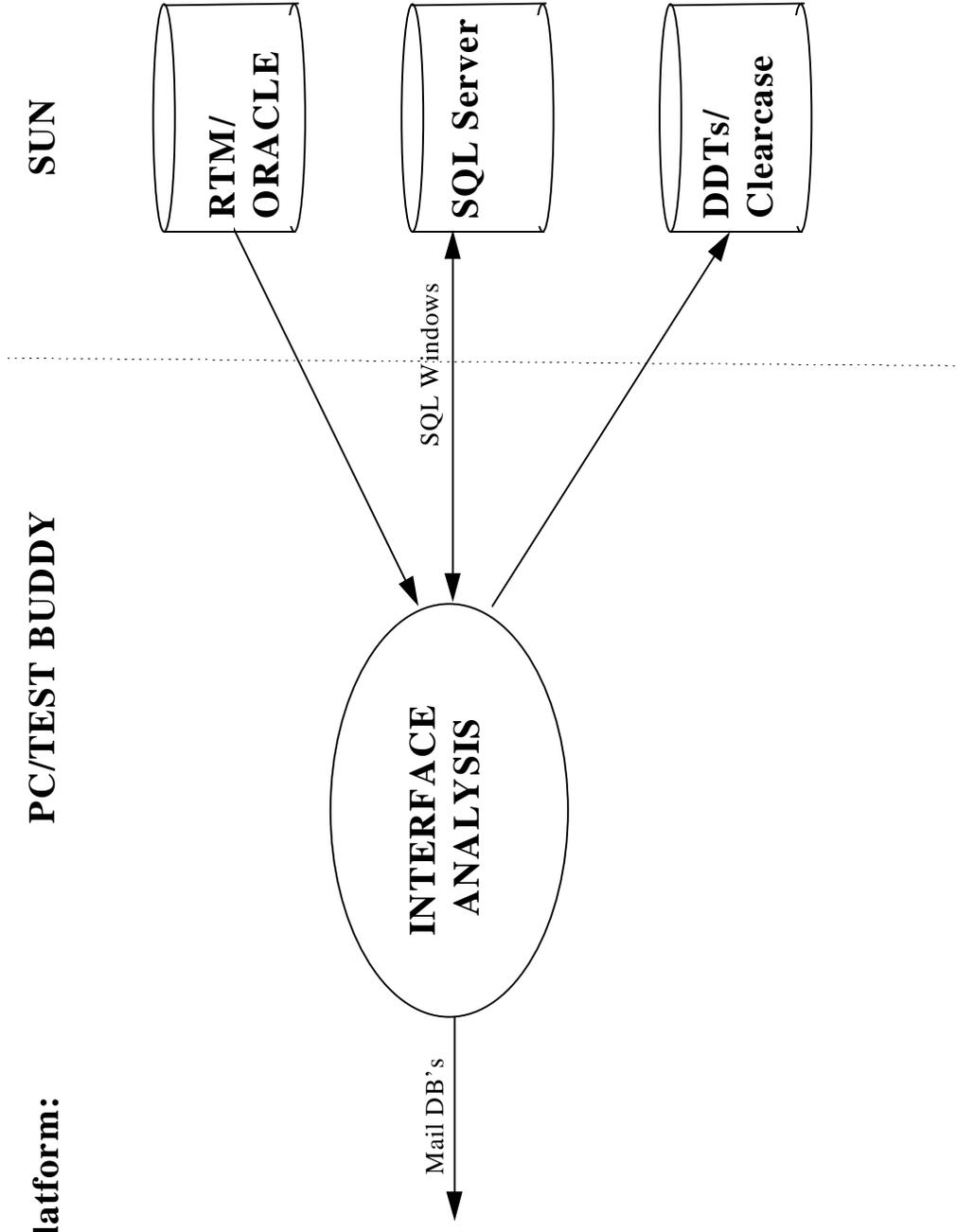


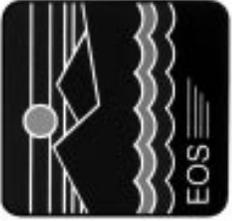
Interface Analysis Database Interaction

Platform:

PC/TEST BUDDY

SUN



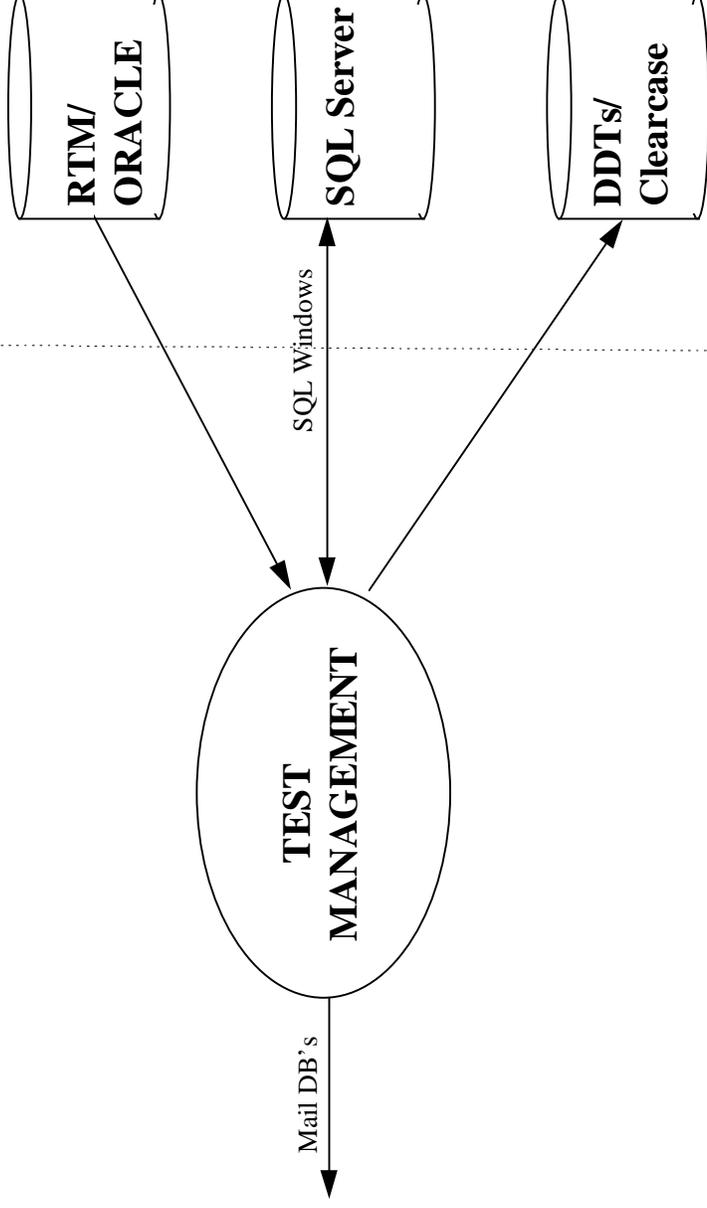


Test Management Database Interaction

Platform:

PC/TEST BUDDY

SUN





Test Buddy

Minimal Configuration

- **DX4 75 Mhz CPU**
- **540 Mb Hard Disk Space**
- **16 Mb RAM**
- **14.4 fаз/voice/data modem**
- **Active matrix color display**